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More frequent publication as acceptable material is contributed.

New Species of Careproctus From Alaska

By WILBERT M. CHAPMAN and ALLAN C. DeLACY
Department of Fisheries, University of Washington, Seattle.

In a shipment of fishes sent to the authors from Petersburg, Alaska, by Miss Dorothy Ruth Scott, an apparently undescribed liparid of the genus *Careproctus* was found. Later five additional specimens were obtained from Miss Scott. These six specimens and five others in the Collection of Fishes, Department of Fisheries, University of Washington, are here described, and named *Careproctus scottae* after the donor.

Careproctus scottae, new species

Holotype.—A female 207 mm. from tip of snout to base of caudal; taken by a shrimp trawler off Petersburg, Alaska, in September, 1932; depth of capture unknown; Cat. No. 2742, Collection of Fishes, Department of Fisheries, University of Washington.

Paratypes. Five specimens from Petersburg, Alaska, obtained from a shrimp trawler; depth of capture unknown; Cat. No. 2743, Collection of Fishes, Department of Fisheries, University of Washington. Five specimens from Thomas Bay, Alaska, collected by C. L. Anderson from a shrimp trawler, in 1920; depth of capture 100 fathoms; Cat. No. 2741, Collection of Fishes, Department of Fisheries, University of Washington.

One paratype has been deposited in the United States National Museum and one in the Museum of Zoölogy, University of Michigan.

Description (based on the holotype and the ten paratypes).—Body shorter and deeper than usual in the genus, its greatest depth just anterior to the origin of the dorsal fin; body and head enveloped in a loose, flexible skin under which is a layer of gelatinous material that is most prominent on the anterior portion of the body and the top of the head; body and head compressed. Skin thickly set with groups of long slender "cactus-like" prickles everywhere except on the tail, the under side of the pectoral fin, the anterior half of the lower jaw, and the snout. Eye moderate, entirely black; the pupil small (contained 7 or 8 times in eye) and round or nearly so; interorbital space wide, the gelatinous material making it appear convex externally so that the eye is situated midway between the dorsal outline and the corner of the mouth. Snout short, rising abruptly from the mouth.

Posterior nostril absent; anterior nostril tubular, much projecting. Two suprabranchial pores separated by a space equal to about half the diameter of the eye; two snout pores, the upper of which is between the nostrils; maxillary pores six, the one posterior to the eye being much smaller than the others; seven mandibular pores, pores along the lateral line, if present; not noticeable in the lax skin. Maxillary ending beneath the anterior third of the horizontal diameter of the eye.

Gill-slit either entirely above the pectoral or extending down in front of one pectoral ray, except on the holotype, in which it extends down in front of three rays on the left side but is entirely above the pectoral on the right side.[1] Four gills, with no slit behind the last. Gill-rakers very short and blunt. Gill-raker formula $2 + 10$ on the anterior arch of one of the paratypes. There are no pseudobranchiae.

Teeth on both jaws arranged in oblique series, which give a rounded, pavement-like grinding surface. Teeth short and slender, without distinct lateral lobes, although on some there is a small lateral hump. No teeth on the vomer, palatines or tongue. A semispherical knob of teeth, apparently supported by the third and fourth suprabranchials, works against a smaller knob of teeth on the fourth basibranchial and a triangular plate of teeth

[1] Because of the lax condition of the skin and flabbiness of the body, some of the characters show considerable variation.

on each infrapharyngeal bone. No teeth on the first two suprabranchials nor on the first three basibranchials.

Anterior edge of disk reaching a vertical through the posterior margin of the eye. Disk small, and made triangular and slightly cupped by the folding under of its lateral and posterior edges. Vent at the end of a distinct papilla, which is separated from the disk by an interval equal to the longitudinal diameter of the disk. Pyloric caeca 15 in the holotype and 18 in one of the paratypes; the longest about 1.5 in the length of the head.

Origin of the dorsal fin over or slightly behind the gill-slit. Anterior third of the dorsal fin rays hidden in the gelatinous mass of the anterior portion of the body, the rays becoming progressively longer and more slender posteriorly. Dorsal connected to the anterior third of the caudal. Anal originating at the vertical through the posterior end of the upper lobe of the pectoral; its rays similar to those in the dorsal fin. Anal connected to the anterior half of the caudal fin. Pectoral fin divided into two lobes by a deep notch. Seven or eight rays of the lower lobe thickened and more or less separated from each other; the longest of these, either the fourth or fifth, not reaching the origin of the anal fin. Distance from the tip of the mandible to the end or the lower lobe of the pectoral about 0.9 the distance from the tip of the mandible to the anus. The caudal fin is short, slender, and truncate.

Body translucent. Color pinkish in specimens which had been in formalin for a month, but entirely faded after six months. Gill cavity, mouth, peritoneum and stomach pale and undotted.

The stomach of the holotype contained a large amphipod and the remains of a shrimp about three inches long.

Dorsal 54 (52 to 56, 55.0)[2] (Table I); anal 48 (47 to 51, 49.5); pectoral 32 (32 to 34, 32.4); lower lobe of pectoral 8 (7 to 8, 7.5); caudal 9 (8 to 9, 8.7); pyloric caeca 15 (18 in one paratype). The dimensions of various characters are contained the following number of times in the standard length: Length of head 4.1 (3.5 to 4.4, 3.9); greatest depth 2.9 (2.8 to 3.5, 3.1); greatest diameter of eye 18.8 (16.2 to 22.7, 19.4); length of upper jaw 10.9 (8.2 to 11.9, 10.1); length of snout 12.2 (9.9 to 15.1, 12.4); greatest width of head 5.2 (5.0 to 6.5, 5.7); length of longest ray of upper lobe of pectoral 6.1 (5.2 to 6.8, 6.1); length of lower lobe of pectoral 4.2 (3.4 to 5.5, 4.4); mandible to disk 10.3 (8.7 to 10.4, 9.5); mandible to anal papilla 6.5 (5.4 to 6.5, 6.2); disk 41.4 (18.6 to 41.4, 26.4); length of gill-slit 12.2 (10.8 to 13.4, 11.9).[3] The dimensions of various characters are contained the following number of times in the length of the head: Diameter of eye 4.5 (4.0 to 6.2, 5.0); length of upper jaw 2.6 (2.2 to 2.9, 2.6); length of snout 2.9 (2.6 to 3.6, 3.1); length of longest ray in upper lobe of pectoral 1.5 (1.3 to 1.7, 1.6); length of lower lobe of pectoral 1.0 (0.9 to 1.4, 1.1); mandible to disk 2.5 (2.1 to 2.9, 2.5); mandible to anal papilla 1.6 (1.4 to 1.7, 1.6); disk 10 (5.4 to 10.0, 6.8); gill-slit 2.9 (2.9 to 3.3, 3.1).

Relationships.—Careproctus scottae is closely related to the group containing *C. pellucidus, C. acanthodes, C. rastrinus* and *C. trachysoma.* From all of these, excepting *C. rastrinus,* it is distinguished by the greater depth of the body[4] (3.5 for *C. pellucidus,* 3.6 to 3.7 for *C. acanthodes,* and 3.5 to 4.1 for *C. trachysoma*). *C. scottae* is further separated from *C. pellucidus* by the smaller eye (3.7 in the head for the latter); the gill-slit not extending down in front of 5 to 6 pectoral rays; and by the presence of prickles on the skin (in *C. pellucidus* there are none).

From *C. acanthodes, C. scottae* is differentiated by the smaller eye (3.5 to 4.0 in the head in *C. acanthodes*); the whole eye being black, instead of the lower half

[2] The number outside the parenthesis represents the type; the numbers inside give the range and mean, respectively, for all specimens.

[3] The range and mean of gill-slit measurements are for nine specimens only.

[4] Figures for other species than *C. scottae* are taken from Burke, *Bull. U. S. Nat. Mus.,* 150, 1930: 1-204, figs. 1 to 110.

TABLE I. MEASUREMENTS OF *CAREPROCTUS SCOTTAE*

Standard length in millimeters	146	152	132	207	227	130	149	190	169	175	161
Character measured in the standard length:											
Length of head	3.65	3.80	3.67	4.14	4.20	3.51	3.82	4.13	4.45	3.89	4.03
Longest diameter of eye	16.22	19.00	16.50	18.82	22.70	21.67	18.62	21.11	21.12	21.87	16.10
Length of upper jaw	9.12	9.50	8.25	10.89	11.35	8.67	9.93	11.87	11.27	10.29	10.06
Length of snout	13.27	11.69	10.15	12.18	15.13	10.83	9.93	11.87	14.08	13.46	13.42
Width of head	5.03	5.07	5.28	5.17	6.49	5.42	6.48	5.28	6.04	6.48	.....
Depth of body	3.04	2.82	2.93	2.88	2.88	2.95	3.55	3.16	3.19	3.12	3.10
Length of upper lobe of pectoral	5.21	5.85	6.29	6.09	5.54	5.65	6.48	6.79	6.50	6.48	5.96
Length of lower lobe of pectoral	3.84	4.61	5.08	4.22	4.36	4.33	5.52	4.62	4.02	4.07	3.42
Tip of mandible to disk	10.43	8.94	9.43	10.35	8.73	8.67	9.93	10.00	9.94	8.75	9.48
Tip of mandible to anus	6.35	6.33	6.00	6.47	6.13	5.42	6.21	5.94	6.50	6.25	6.45
Longitudinal diameter of disk	29.20	25.33	22.00	41.40	32.43	21.67	18.62	23.75	24.14	25.00	26.83
Length of gill-slit	11.23	10.86	11.00	12.17	.....	10.83	12.41	12.67	.....	12.50	13.42
Character measured in length of head:											
Diameter of eye	4.44	5.00	4.50	4.54	5.40	6.17	4.88	5.11	4.75	5.63	4.00
Length of upper jaw	2.50	2.50	2.25	2.63	2.70	2.47	2.60	2.88	2.53	2.65	2.50
Length of snout	3.64	3.08	2.78	2.94	3.60	3.08	2.60	2.88	3.17	3.46	3.34
Length of upper lobe of pectoral	1.43	1.54	1.71	1.47	1.32	1.61	1.70	1.64	1.46	1.67	1.48
Length of lower lobe of pectoral	1.05	1.21	1.38	1.02	1.04	1.23	1.44	1.12	0.90	1.05	0.85
Tip of mandible to disk	2.86	2.35	2.57	2.90	2.08	2.47	2.60	2.42	2.24	2.25	2.36
Tip of mandible to anus	1.74	1.67	1.64	1.56	1.46	1.54	1.63	1.44	1.46	1.61	1.60
Longitudinal diameter of disk	8.00	6.67	6.00	10.00	7.71	6.17	5.57	5.75	5.43	6.43	6.66
Length of gill-slit	3.08	2.86	3.00	2.94	.....	3.08	3.25	3.07	.....	3.21	3.34

being silvery as in *C. acanthodes;* the longer lower pectoral lobe (1.8 to 2.0 in head in *C. acanthodes*); and the smaller disk (4.5 to 4.8 in the head for *C. acanthodes*).

C. scottae differs from *C. trachysoma* in the smaller number of dorsal rays (58 to 60 in the latter); in the smaller number of anal rays (53 to 55 in *C. trachysoma*); by the absence of dark pigment (*C. trachysoma* has dark pigment on the lips, peritoneum and stomach); and by the smaller gill-slit (the gill-slit in *C. trachysoma* extends down in front of one to five pectoral rays).

C. scottae is most closely related to *C. rastrinus,* from which it differs in the following respects: The pectoral rays are fewer (32 to 34 instead of 34 to 37 as described for *C. rastrinus*); the lower lobe of the pectoral has seven or eight rays instead of ten rays as shown by Burke *l. c.,* p. 136, fig. 57) for *C. rastrinus;* the longest rays of the lower lobe of the pectoral fin do not reach to the origin of the anal fin as they do in *C. rastrinus;* the gill-slit is usually above the pectoral fin or extends down opposite one pectoral fin ray, instead of 4 to 5 rays as in *C. rastrinus;* and dark pigment is absent in *C. scottae* (in *C. rastrinus* pigment occurs on the stomach and part of the intestine, and on the bases of the caeca).

The four species of *Careproctus* to which *C. scottae* appears to be most similar are all confined to the Asiatic side of the Pacific, while *C. scottae* has been taken only in Alaskan waters.

The Cottoid Genus Hemilepidotus of the North Pacific

By LEONARD P. SCHULTZ and ARTHUR W. WELANDER
Department of Fisheries, University of Washington

During the summer of 1933, Dr. Carl L. Hubbs, curator of fishes, Museum of Zoölogy, University of Michigan, gave us the opportunity to work up a series of collections of fishes made in Alaska by W. J. Eyerdam during 1931 and 1932. Although these collections contained little of especial interest, they did furnish a series of specimens which enabled us to clarify the status of certain North Pacific fishes. The Gadidae are being treated in a separate contribution, and one genus of Cottidae is treated in this paper.

In a recent paper P. Schmidt (1929: 360-364), with very limited material, took *Hemilepidotus jordani* to be a subspecies of *H. hemilepidotus,* saying,

"But if we compare the measurements of forms of our collections which have a wider interorbital space and a pure white belly (Table II) with measurements of *Hemilepidotus hemilepidotus* Til. (Table I), we shall see that the variation of the length of the head, the depth of the body, the diameter of the eye and the width of the band of the scale-like plates is in both groups very similar and can not be used for distinguishing both species. The width of the interorbital space varies in the first group between 19.2-24.2% of the length of the head, in the second (*H. hemilepidotus*) between 12.0 and 18.6% of the same length. The variation is also nearly continuous and gives no ground for separation of these two species. The coloration is very variable and one can also find specimens with wide interorbital space (that is, belonging to *H. hemilepidotus*) and with a spotted belly (cf. No. 1655 of our collection) as in *H. jordani.*

"I regard therefore the form with wider interorbital space not as a separate species but as a subspecies—*Hemilepidotus hemilepidotus jordani* Bean."

Our measurements of the interorbital space for each species cover almost the entire range of variation indicated by Schmidt for both forms (Table I). We find other characters, however, which indicate specific differences. They are:

1. The belly is usually white and unspotted in *jordani,* but heavily spotted in *hemilepidotus.* Occasionally there are a few spots along the sides of the belly in *jordani,* but the chin in that species is invariably unspotted, whereas it is always spotted in *hemilepidotus.*

2. There are 13 to 16 pairs of dermal cirri around the head, usually 14 to 15 in adults of *hemilepidotus,* but only 7 to 13 on *jordani.* The dermal flap beside the

nasal spine in *hemilepidotus* is large and very distinct, while in *jordani* it is either wholly absent or represented by a very small conical structure.

3. The number of soft rays in the dorsal, anal, and pectoral fins consistently averages one or two more in each fin in *jordani* than in *hemilepidotus* (Table II). If the number of soft rays in the dorsal, anal and two pectoral fins of each specimen are added together and these totals arranged in the form of frequencies, no overlapping in the number of rays between the two species occurs. Our data were obtained from specimens collected in California, Oregon, Washington and Alaska, and show no evident latitudinal variation in the number of fin rays.

The results of our study confirm the view of Gilbert and Burke (1910: 53-54), that *jordani* is specifically distinct from *hemilepidotus,* and contradict the statement of Schmidt (l. c.) that the two forms are only subspecifically distinct.

TABLE I. SUMMARY OF THE PER CENT OF INTERORBITAL SPACE INTO THE LENGTH OF THE HEAD

Interorbital space in hundredths of the length of the head

	12	13	14	15	16	17	18	19	20	21	22	23
H. jordani												
Alaska	....	....	1	1	7	13	27	39	35	6	2	2
H. hemilepidotus												
Alaska	1	1	2	....	2	2	1	....	....	....	1	....
Washington	....	....	....	1	4	7	4	1	2	1	....	....
Oregon	....	1	1	6	10	7	7	3	1	....	....	....
California	....	....	2	3	9	8	5	5	....	....	....	....

TABLE II. THE NUMBER OF SOFT RAYS IN *HEMILEPIDOTUS HEMILEPIDOTUS* AND *H. JORDANI*

(The Alaskan specimens counted are all from Sitkalidak and Kodiak Islands)

Number of fin rays

	13	14	15	16	17	18	19	20	21	22	23	Total	Average
Anal fin:													
H. hemilepidotus													
Alaska	....	1	9	....	....	....	....	....	....	....	....		
Washington	....	....	19	1	....	....	....	....	....	....	....		
Oregon	....	4	26	6	....	....	....	....	....	....	....		
California	1	11	19	2	....	....	....	....	....	....	....	99	14.91
H. jordani	....	....	....	38	89	6	....	....	....	....	....	133	16.76
Dorsal fin:													
H. hemilepidotus													
Alaska	....	....	....	....	....	3	7	....	....	....	....		
Washington	....	....	....	....	....	4	16	....	....	....	....		
Oregon	....	....	....	....	1	7	27	1	....	....	....		
California	....	....	....	....	1	6	25	1	....	....	....	99	18.78
H. jordani	....	....	....	....	....	....	4	51	74	3	1	133	20.59
Pectoral fin:													
H. hemilepidotus													
Alaska	....	....	2	15	3	....	....	....	....	....	....		
Washington	....	....	6	34	....	....	....	....	....	....	....		
Oregon	....	....	9	60	3	....	....	....	....	....	....		
California	....	....	46	235	6	....	....	....	....	....	....	419	15.88
H. jordani	....	....	....	....	35	201	30	....	....	....	....	266	17.98

Total number of soft rays in anal, dorsal, and the two pectoral fins.

	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	Total	Average
H. hemilepidotus	3	17	15	45	8	1	....	....	....	....	....	....	....	....	....	....	89	65.46
H. jordani	....	....	....	....	....	....	....	....	9	32	28	43	16	3	1	1	133	73.32

Migrations of Food Plants in the Pacific

By LORIN TARR GILL

Did the early inhabitants of Polynesia have contact with tropical America? If not, how did they obtain the pineapple?

A new light on the origin and migration of the natives of the South Pacific islands—information which bears definitely on the time and source of immigration of the early inhabitants of the Marquesas and their subsequent intercourse with other parts of the Pacific—is found in the discoveries of Dr. Forest B. H. Brown, botanist of the Bishop Museum.

It becomes increasingly evident that, though the main stream of Polynesian immigration to the Marquesas came from the west, there was undoubtedly some contact between those natives and the natives of the American continent.

The botanist paints a remarkable picture of the dependence of the aboriginal inhabitants upon their plant life and shows conclusively that, while most of the indigenous seed plants of the archipelago have allies in America, nearly all plants of aboriginal introduction which were growing in the islands at the time of discovery had their origin in Asia. Also, many weeds of Asiatic origin which were of no use to the natives were unintentionally introduced by them.

The islands included in the survey embrace every condition of soil, topography and climate under which the Polynesians were living at the time of discovery by Europeans.

It would be hard to devise a more perfect plan for utilizing the natural conditions of an archipelago than that developed by the Marquesans, Dr. Brown says.

As the indigenous vegetation offered little in the way of food, it was necessary for the first arrivals to bring native food plants with them and also to develop a system of agriculture best adapted to the climate and soil conditions and the growing needs of the population.

Every available space in the valleys and even on the mountain sides was utilized for the growing of food, medicinal, clothing, fiber and ceremonial plants. When the original vegetation was destroyed, new strains of plants were carefully selected, and grown under conditions best suited to them in plantations having a definite order in the area occupied by the tribe.

Valleys which were extremely difficult of entrance were set aside for the growing of food plants intended for use in emergency. Dr. Brown describes one in the interior of northwestern Fatuhiva, several miles in extent and so difficult of access that not a single pig, goat or other destructive animal has ever found entrance to it. There, he says, the many phases of Marquesan agriculture which have been more or less completely effaced elsewhere in the islands exist intact and can be traced in detail.

There is no doubt but that the pandanus is by far the most important and useful plant to the Polynesian inhabitants of the tropical Pacific islands. In all likelihood the useful species were cultivated from the very beginning of their agricultural practices and the many characteristics of the various forms are the result, in part, of native selection. It may be found, too, that certain species are of ancient aboriginal introduction.

Throughout the Tuamotus the pandanus was the chief source of plant food. On those low coral islands where taro, banana, sweet potato, breadfruit and every other native food plant, with the exception of coconut, is grown with the greatest difficulty, it flourishes without cultivation. It was also important in the Ellice, Gilbert and equatorial islands and to the inhabitants of northern Australia.

While the pandanus was not much used as a food plant on high tropical islands such as the Marquesas, it served many other purposes, being used for adornment, the scenting of coconut oil, intoxicating drinks, mats, sails, thatch for houses, fiber

for cordage, and wood for spears. One variety, with deep red fruits, believed to have originated through native methods of selection and cultivation, became so closely associated with religious practices as to be considered sacred.

The coconut, it is believed, was indigenous to the Marquesas, where the natives cultivated not less than 50 varieties. Although the breadfruit ranked first in importance, the coconut played an important part, yet on account of the large population, it was used as food only on festive or special occasions or during famine.

With the advent of modern houses and appliances the coconut still serves many purposes and its use as a food plant has increased. The steam from its heated flesh is considered to have a medicinal quality; the sap from the green nut frequently takes the place of water on long trips; the soft curdlike flesh of the immature nut is fed to babies and young suckling pigs; an intoxicating drink is made by fermenting the sap, and the oil is used in many ways. Empty coconut shells still serve as containers and the nuts as playthings for children; the fibers of the husk are braided into cordage of sennit and are rolled together to make fishing lines; and the leaves serve as thatch for houses and for fans and baskets. The midribs, fastened together as bundles, are used as brooms, and flowers are strung on them for use as leis. The terminal bud of the palm makes delicious salad.

Taro, undoubtedly ranked next to breadfruit as one of the leading food plants of the ancient Marquesans and, though the varieties which are extremely acrid and require long baking in the oven are not cultivated to any extent today, the improved rapid-cooking types are extensively employed in making modern dishes.

Six forms of the pineapple, originated by the Marquesans from a single species endemic to Brazil and which have been known there since ancient times, offer evidence that the early Polynesians, through contact with America, obtained their original stock long before the discovery of the archipelago by Europeans.

Today pineapples are found in all inhabited valleys, yet they are planted more commonly in the arid uplands in situations too dry and exposed for other plants of the native agriculture.

One of the largest pineapple plantations in the Marquesas is in eastern Fatuhiva, on the dry, rocky exposed slopes of Mouna Natahu, at an altitude of over 1000 feet. The trees and shrubs originally covering the mountain have been removed and there the pineapple grows luxuriantly without cultivation of any kind, the long stems covering the rocks and stones where few other plants can grow.

The Marquesan pineapples are small in comparison with the commercial varieties but they are extremely fragrant and superior in flavor, Dr. Brown says. They were valued in ancient times for their fruits and leaves, the former being used more extensively for leis and for scenting coconut oil than for food.

The ti, an Indo-Malayan plant, was of ancient aboriginal introduction and many varieties were grown in Polynesia. Cultivated in the Marquesas, as elsewhere, for its leaves, the roots of some types yielded food which was appreciated in time of famine.

The leaves are valued chiefly as wrappers for food stored. Leis are made from them; they are fashioned into skirts to be fastened around the waist and an intoxicating drink is still made from the fermented root.

The banana seems to have been one of the first important food plants introduced by the Polynesians at the beginning period of their agriculture and not less than 75 varieties were cultivated by the ancient Marquesans. The natives had a thorough understanding of the plant's cultural requirements and the knowledge of all its useful properties in connection with ancient practice.

In times of great shortage the fresh fruit was used in the place of breadfruit or taro in the making of poi. It was baked in the native oven, substituted for breadfruit and used in combination with

coconut cream to form some of the native delicacies. The fruits of certain varieties were selected for sacrificial offerings.

The outer tissues of the trunk, stripped into narrow ribbons, were used as cordage. The green leaves served as the outer lining of "ma" pits for storing fermented breadfruit and the juice and green tissues of several forms were used in native medicines.

At the time of discovery the banana had become subordinate to the breadfruit as a food plant; and, at the present time, those of modern introduction are more valued for food. All the native varieties, however, yield abundantly with little cultivation.

The wild ginger is doubtless of early aboriginal introduction and has become naturalized in all the high islands of tropical Polynesia. The Hawaiians as well as the Marquesans used the clear, watery juice from the inflorescence for sprinkling upon the hair and, in emergencies, for quenching the thirst, and the foliage was used to scent tapa.

Among the Mangroves in Fiji

By MARGUERITE W. CROOKES, M.A.

It was with very considerable eagerness that I awaited my first visit to a tropical mangrove swamp. I was also apprehensive, for our New Zealand mangrove swamps are apt to be somewhat noisome places which one contemplates with greater pleasure from afar. A tropical mangrove swamp is very different.

To begin with, some mangroves attain the height of forest trees, so that we have a forest rather than a swamp—a forest with all its implications of dignity and mystery. I used to love the roadway through the swamp best when the tide was in—when all the silent winding channels brimmed with water so still that not a leaf was blurred. Along the bank multitudes of young mangroves grew in serried ranks, covering the swamp floor everywhere, and over all the full-grown mangroves, gnarled and massive, spread their great green crowns in almost all parts, shutting out the sun. A quiet place, the mangrove swamp—very quiet and peaceful, its silence broken mainly by the long-drawn haunting call of the honey-eaters, the soft rustling of brightly colored soldier crabs scuttling to their holes, or the sudden soft "plop" as a long green mangrove fruit detached itself and dropped into the quiet tide. And strange indeed these fruits are, like many other things about the mangroves.

It is a good old Anglo-Saxon proverb that says you cannot have your cake and eat it. Well, if you happen to be a tree you cannot expect to live a pleasant, amphibious life in situations where few others venture to compete with you, and at the same time enjoy all the ease and security of orthodox life on land. There are all sorts of difficulties about the amphibious environment, and the mangroves have their own way of meeting them.

There are in Fiji two main kinds of mangrove, those belonging to the family Rhizophora and those belonging to the family Bruguiera. Rhizophora means literally "root-bearing," and you do not need to look closely at the plant to understand the name. The Rhizophora flings down quantities of aërial roots from its branches, even from its highest ones.

Now, this mass of roots gives the mangroves a most bizarre appearance; in some cases it gives them the aspect of having spindly legs, not unlike gigantic stick insects. These roots not only give the mangroves secure foothold among the moving water, but they also serve the very useful purpose of enabling them to augment their supply of oxygen. Salt mud may be very cool and damp, but it is not the best aërated thing in the world. Our own New Zealand mangroves

deal with the oxygen shortage in quite a different way. Instead of sending roots down from above they send roots up from below, hence the slimy little "pegs" that are so annoying if one is trying to cross the swamp barefoot.

But having safeguarded its own foothold in the mud or coral sand, the mangrove has a still graver difficulty to deal with. How can it safeguard the interests of its children? The situation is a complicated one. In the first place, the fruits are likely to fall into the moving tide; in the second, how can they root on ground that is being constantly covered by moving water? On the one hand, they must be prevented from drowning, on the other hand they must be given some means of gaining a foothold in their slippery home.

Not content with the formation of a fruit in the ordinary way, the tree actually produces a young plant. The seed germinates while still attached to the tree, and grows steadily till it is several inches long. At this stage it is a sturdy cylinder, shaped somewhat like a big green cigar. It is now finally cast forth from the parent, and left to fend for itself.

Various interesting provisions have, however, been made for its future. In the first place, mangrove seedlings are able to float. Not only that, but they float in a vertical position. Thus on calm, hot days they are to a very considerable extent protected from the sun's rays. Their weight, however, is so nicely balanced that while they float upright in salt water they become horizontal in fresh.

Cast forth upon the water, the seedlings of Rhizophora can float unharmed for three or four months, those of Bruguiera for even longer. Once established in a suitable position they strike very quickly and soon become flourishing young plants.

Even from this brief and of necessity superficial sketch my reader will gather by what delicately adjusted means the mangrove fits itself to its chosen surroundings. How, then, shall we regard the mangrove? As one of the most specialized "up-to-date" plants, that has by slow degrees fitted itself for the exigencies of amphibious life? Mr. Guppy, however, that fascinating authority on the Western Pacific, has other views.

The mangroves, he thinks, are essentially survivals. They come down to us a remnant from a far-distant past, a past when the earth was clothed in dank and clinging mist that stifled out the sun, a past in which no human voice had yet troubled the immemorial solitudes. At that time, thinks Mr. Guppy, the germination of seedlings while still attached to the plant was not the exception but the rule.

Then with the slow passing of the ages the climate of the earth gradually changed, and it is only in such situations as those represented by the chosen habitation of the mangrove swamp that something resembling the old conditions still remains.

The Musk Mystery

By A. W. of the Auckland Star

That very insignificant-looking little plant, the common musk, has never been content to grow unseen. It first made itself popular by a distinct and all-pervading perfume, and in losing this it provided a first-class botanical mystery which has ever since kept the musk well in the forefront of public attention. Dr. A. W. Hill, Director of Kew Gardens, revived interest in the problem when in an address to the Botanical section of the British Association at its meeting in Bristol he alluded to the unexplained change that had come over the plant.

Botanically, the scented musk is *Mimulus moschatus,* and it is a native of

western Canada. It never had anything to do with the musk perfume of commerce, of which the best is of animal origin, being derived from the musk deer. The first plants to be grown in England were raised from seed sent from near Vancouver in 1826, and it rapidly became so popular that eventually no home was complete without a pot of musk. The same may be said of New Zealand. As late as the 'nineties a pot of the sticky-leaved, yellow-flowered plant kept company with a singing canary in practically every Auckland bay window. It was also the sign manual of shops which sold milk and butter. Its disappearance was sudden and complete. There did not seem to be any comment on the loss of scent at that time. It was the plant itself that disappeared. That is quite understandable. People whose plants had become scentless would think they had become exhausted and throw them out; thus the musk would gradually disappear from cultivation. Not until notes were compared from widely separated countries was it understood that this was part of a world-wide happening.

According to the "Gardening Year Book," which has recently been investigating the history of the musk plant in England, it is generally accepted that the scent was lost during the first decade of the twentieth century. The version that finds most popular favor is that it was lost during the first year of the war. The editor of the "Gardening Year Book," however, maintains that there were always two varieties in England, one with scent, and the other without, and that the wild one was usually scentless, had larger foliage, and was not so sticky as its more valuable relative. Other people, however, claim to have found wild plants with the same scent as the cultivated ones.

One of the first definite pieces of evidence of the general change which the musk plant was undergoing was an inquiry published in the "Gardeners' Chronicle" during 1909, asking if anyone knew of the existence of a scented specimen. No altogether satisfactory explanation of the loss of scent has been arrived at, although many interesting theories have been advanced. One is that the plant was subjected to the influence of other varieties of *mimulus,* partly through inadvertence, and partly also by the efforts of horticulturists to breed a variety which would have the showy, spotted flowers of the garden *mimulus,* while retaining the scent of the musk. Reliable nuserymen, however, have claimed that they conserved their original stocks quite uncontaminated by the introduction of other varieties, and yet the perfume vanished completely and with comparative suddenness. The fact that the scent of the musk, instead of being centered in the flowers as in most plants, was apparently contained in a sort of secretion which made the leaves and stems sticky, is also held to be of interest. One scientist is of opinion that this secretion was an indigested residue of the plant's food, which it has since evolved means of absorbing, thus removing the basis of the perfume.

The most feasible explanation so far advanced, however, is that the scented musk was itself a variant of an unscented stock, and that the plant has gradually—as plants have a habit of doing—reverted to the original type. This is confirmed by a statement from Canada that the scented musk was never really common in that, its native, country, and that it had been entirely wiped out by the over-export of the plants.

Hope of discovering some lingering survivor of the scented musk has not been entirely abandoned. The inquiry conducted by the "Gardening Year Book" has brought to light the fact that a few plants at Wadsworth, in Sussex, had retained their perfume as recently as 1929, only to become entirely scentless by the following year.

Medical Service in Papua

By DR. W. M. STRONG

(At a meeting of the Australian Medical Association, Victorian branch, with Sir James J. Barrett presiding, Dr. Strong referred to medical work in the more primitive parts of the Empire, especially in Papua where he worked for some 30 years, emphasizing the changes which have taken place in the medical work since early territorial days.)

I first went to Papua as a member of an anthropological expedition, and on the termination of the expedition entered the Government service. At that time my work was more magisterial than medical. My first appointment was that of an Assistant Resident Magistrate in charge of a district. I set out on a small sailing boat for my headquarters some 60 miles west of Port Moresby, and on the first night of my arrival learnt that in a neighboring village there had been a village affray, with several cut heads as a result. The village policeman duly reported to me, so I intimated that the assailants would be arrested and those with cut heads would be sewn up. However, the last was clearly a mistake. There was no difficulty in arresting those guilty of an "unlawful assault" if they were undamaged, but it was otherwise with those who were injured. I found that there was considerable difficulty in getting the latter, as the idea of being sewn up was quite new and most alarming to the villagers. A more civilized native explained to me that human beings were not bits of cloth. However, all the cut heads were duly sewn up in the most approved hospital style.

Shortly afterwards I was called on to act as chief medical officer in Port Moresby, and incidentally as an assistant resident magistrate also. At this time it was considered hardly possible to treat the natives medically, so afraid were they of the white man's magic. But a native of one of the Port Moresby villages was badly damaged by a wild pig. The natives agreed that I should take charge of the case, but on the distinct understanding that there should be no cutting and no sewing up. I had to agree to this. Surgical aid was rendered in a large native house with an audience of about 30 natives. All I could do was to use antiseptics and adhesive plaster in place of surgical needles and thread.

Another incident of a somewhat similar character occurred some few years later a long way from port in the northern division of Papua. I was coming down the Mambare River in a canoe and visiting the villages on the bank. The villagers had all been warned that I was coming and told to remain in their villages. But I do not think I saw a single patient. At one large village I landed, and the village policeman came along smiling and expecting his usual stick of tobacco. I enquired if the people were all in the village, and he said they were. I duly inspected them and found no patients. I then said to the village policeman, "Are there no sick in the village?" He said, "Oh, yes." I then said, "Where are they?" He replied that they had heard I was coming, so all the sick had hidden in the bush. One can deduce from this that before one can treat sick natives, and for that matter any sick people, it is necessary first to gain their confidence and to assure them that you not only really are trying to help them, but will also deal very tenderly with their fads and fancies.

The medical policy of a country like Papua is by no means an easy one to decide upon. The population of Papua is about 300,000 natives, and to treat Papuans on the lines on which patients are treated in Australia, some 300 doctors with drugs, &c., would cost some £300,000 per year, an amount about twice the yearly revenue of the territory.

The natives' monthly wage, in addition to their food and a minimum of clothing, is only 10*s*. a month, and medical practice amongst them is naturally given gratis. Papua has an area approximately 100,000 square miles, and with the exception of the neighborhood of Port Moresby, transport is still of the most primitive description.

The exigencies of European population have made is necessary for a fully qualified doctor to be stationed at Port Moresby and another at Samarai. At these two places a native as well as a European hospital is maintained by the government. Both are well patronized. But much of Papua is too far away from these two centres for the average village native to make much use of them. The difficulty in Papua has always been to reach the quarter of a million natives or so who are under control but far away. Much of this village work is done by missionaries, government officers and other Europeans. In fact, in Papua almost all Europeans living outside of Port Moresby and Samarai have to take some part in treating those out of health. The government maintains a traveling medical officer and four traveling European medical assistants. Their work is mainly that of treating village natives. A large number of traveling native medical assistants are also maintained by the government. The medical assistants, both European and native, get some training in the native hospitals and otherwise, but it is not of a very systematic nature, and in no way comparable with the training a qualified doctor gets. Still much very useful work has been and is still being done by both European and native assistants. I would more particularly mention the injection work for yaws. This tropical disease was very widespread in Papua, as it is on other parts of the Southern Pacific. Many thousands of injections have been given by medical assistants, and the ulcers which used to be so common in the villages are now comparatively seldom seen. In the earlier days a native was taught to give these injections, although he could not read or write. He used simply to make a stroke on a piece of paper as a record of how many cases he treated. Now, however, the leading native medical assistants have been taught to make and to send in their reports in the same way as the Europeans.

Recently the traveling staff have had to deal with village epidemics of dysentery. Two epidemics amounting in all to over 30 cases have been very successfully dealt with by native medical assistants without immediate European supervision. In addition, a great variety of trivial conditions are treated by the traveling staff. Perhaps I should also mention the dispensary work which is being carried on in Port Moresby. This is in the immediate charge of a native who has been taught the use of a limited number of simple medicaments. This dispensary is freely used by the natives living in or working around Port Moresby. It is also well patronized by the more distant natives who apply for such things as quinine, skin treatment or Epsom salts when they visit port. At times they come quite long distances simply for the purpose of getting medicine. The work done in it is in no sense hospital work. It rather represents a free chemist shop. The native in charge keeps a record of all applicants and of what they are given.

Fiji has done much very valuable work in the matter of training some of the Fijians along systematic lines. I understand that the training now given extends over four years. I am hoping that in the not very distant future it may be possible to make arrangements for sending Papuans for training in Fiji. I am aware that difficulties will be encountered. The greatest difficulty I have had in the matter of getting natives to do traveling medical work has been that of getting them to travel alone in districts of Papua they do not know. It was the greatest obstacle I had to overcome when first introducing the plan of using natives to

carry out independent medical treatment. It required at one time infinite tact and patience. Another difficulty experienced at first was to get Europeans to acquiesce and assist in carrying out the policy. But such difficulties are gradually disappearing. Several of these native medical assistants are now stationed in the different magisterial divisions and districts. Although as regards their medical work they are directly responsible to the Chief Medical Officer, they are supervised by the resident magistrates. I have also on several occasions been asked by those in charge of non-government plantations to send such natives to help in the treating of the plantation labor force. There are several advantages in using natives for this work. Few natives can talk English fluently. A European medical practitioner is very helpless amongst natives unless he can converse fairly readily with the patient or his relatives. The native languages of Papua differ very much in grammatical structure from European languages, and it is impossible to translate from one to the other by merely giving a word for word translation. Apart from the matter of translating, it is very difficult for a European to follow the native method of thinking, and both understand and sympathize with his fears and fancies unless he can understand a native language. I would remind you that doctors not only have to do such things as take temperatures and count pulses, but they have to listen to the patient's description of his troubles as they appear to the patient. Such description by the patient gives the doctor as a rule a valuable guide as to the lines of further investigation in the case. In a few cases the doctor may treat his patient on quite the wrong lines if he has not obtained a correct medical history of the case. In practice the great difficulty is to find someone who can not only get a history of the case but has also sufficient technical knowledge to make use of the history. Again, it is seldom that a native is quite at ease when talking to a European and is very sensitive to ridicule. He may fear that he will be compelled to do something he strongly dislikes and does not believe in. He is aware that the European thinks and feels along different lines. If he were being treated by other native he would feel that he still had considerable say in the matter of doing things he did not like. If treated brusquely he soon gets frightened and warns all his friends against applying for treatment.

Some years ago there was an alarm that some of the Dutch islands near Papua had smallpox, and a beginning had to be made in the matter of introducing vaccination, more especially around the ports of entry. I explained this to several natives and told them they need not be afraid, as the government would "make medicine" (*i.e., vaccinate*) so that the disease would do them no harm. Nothing more was done for a fortnight. Then two natives asked me when the government was going to begin making this medicine. I said, "Well, if you will come back at two o'clock I will make this medicine." At two o'clock they duly turned up and with two of their friends. They were all four vaccinated. And when their arms got sore they were in the position of the fox without a tail and naturally had to explain to their friends what powerful medicine it was and how it would protect them from disease. In point of fact since then there has never been any difficulty in getting natives around Port Moresby to submit to vaccination. Had the first few cases of vaccination been done by compulsion or even by quasi compulsion, I am certain it would have been quite otherwise. Several hundred vaccinations have since been done by the native medical assistants in the villages around Port Moresby and without immediate European supervision.

This paper would not be complete without a tribute being paid to the missions of Papua, who have rendered assistance

to the medical work there. The European missionaries in Papua far outnumber the European doctors and medical assistants. They are in closer contact with the natives as a rule than are government officials, and many of them take a real interest in the bodily well-being of the native. Their work is, therefore, of great value. In addition, two of the missions have a qualified doctor who supervises the medical work done by the mission.

Oriental Vegetables in Hawaii

In addition to the ordinary garden variety of vegetables, such as carrots, peas, beets, beans, and lettuce, markets in Hawaii exhibit other vegetables quite unfamiliar, according to Earl Nishimura, country agent at large for the agricultural extension service, University of Hawaii. Among the exotic vegetables, mostly of Asiatic origin, displayed in Hawaii's markets in bamboo baskets and trays are the following:

"Chinese cabbages of a dozen or more varieties, natives of Asia. Probably the best known of the Chinese cabbages and most extensively grown is the Wong Bok, a compact, blanched head type. Fine specimens are produced in the vicinity of the volcano district in Hawaii and Kipapa Gulch of this island.

"Watercress, a floating perennial and a native of Persia, is a vegetable which appears on the mart throughout the year. It is frequently observed growing in fresh, running water, adjacent to springs in the vicinity of Honolulu and Pearl City.

"Edible bamboo shoot, which is a native of China and Japan, is the immature stalk of certain species of the larger bamboos. It is greatly relished by the Japanese and the Chinese in making many of their choice dishes. Occasionally, one finds them growing in Pauoa, Palolo and Manoa Valleys.

"One hardly thinks of green soy beans as vegetables. The green pods full of beans are boiled with a little salt, and eaten. They are very appetizing and nutritious. Their native home is Asia.

"Lotus root is one of the unique vegetables grown here. It is aquatic in habit and is said to be indigenous to China, India and Persia.

"Bean sprouts are prepared daily for the vegetable market in Honolulu, mainly by the Chinese. The sprouts are obtained by germinating the soy bean and mungo beans. They are tender and crisp and are proving very popular here.

"Chinese spinach is another new variety which is eaten in the seedling stage. It is a native of India but not related to the true spinach.

"Balsam pear or Chinese bitter melon, conspicuous in the Oriental garden, is long, ribbed and covered with blunt warts. It is bitter and is not readily taken as food by others than the Chinese. It must be picked immature for table use.

"The dishcloth gourd, a viny, monoecious annual and indigenous to India, is another unique vegetable. Like the balsam pear the gourd must be picked immature for table use.

"Great burdock, a native of Europe and Asia, is an elongated root. It is largely confined to the Japanese for table use. Some of the finest specimens of burdock come from the Kamuela district of Hawaii.

"Butterbur, cultivated in a limited quantity, is a perennial herb with creeping rootstocks and broad leaves. The petiole of the butterbur is sold on the market.

"Chives, a native of Europe and Asia, is commonly used by the Oriental people in flavoring their dishes. It is prepared for the local market in bunches.

"One will occasionally find Oriental vegetables like honeywort, perilla, and mugwort in very limited quantity on the

market. They are principally used for flavoring soup and coloring festival rice cakes.

"Root and aquatic vegetables like arrowhead, arrowroot, ginger bracts, water chestnuts and yam bean roots are popular ingredients in many Oriental mixed dishes.

"The aforementioned vegetables are some of the Oriental vegetables introduced here and have found an important place in the dietary of the local cosmopolitan population. Any person who is interested in our exotic Oriental vegetables can read the 'Utilization and Composition of Oriental Vegetables in Hawaii,' Bulletin No. 60, of the Hawaii Agricultural Experiment Station.

"The agricultural extension service has as one of its projects commercial vegetable growing, specializing in the growing and improving of more introduced vegetables of the Old and New World to enrich the market gardening of Hawaii."

Pan-Pacific Science Council for China

Among the distinguished speakers before the Pan-Pacific Science Council of Manila on May 10 were Senator Manuel Quezon, Alexander Hume Ford, Director of the Pan-Pacific Union, and Dr. C. T. Wang. The latter spoke on the need of a Pan-Pacific Science Council in China along the lines of those in Manila and Honolulu, where a weekly dinner and discussion hour precedes a more formal lecture or talk illustrated with slides or motion pictures. Mr. Ford, who is now on his way to Siam, where he was invited to help organize a Pan-Pacific Club in Bangkok, will return to Shanghai to inaugurate the Pan-Pacific Science Council Friday night programs, first in Shanghai, then in other large centers. The experiments tried out during the past twenty years in Honolulu are now being utilized throughout the Orient in a most practical way.

Dr. Wang stated that recently all the efforts of the Pan-Pacific associations are directed towards making the Chinese science-conscious. These efforts are bearing results. About a year ago a regulation was passed in China prohibiting all colleges and universities from adding new classes on law, medicine and other courses, and requiring them to have all students take up science. Dr. Wang admitted that this movement has been overdone to some extent, but he said it proved how important the movement along scientific lines is to a nation.

Other speakers during the evening were Dr. Manuel L. Roxas, under-secretary of agriculture and commerce, Gregorio Nieva, secretary of the Manila Pan-Pacific Association, and Ryozo Hironuma, member of the Japanese House of Peers and head of the Japanese delegation to the Far Eastern Olympic Games.

The big lecture hall of the Hygiene Institute adjoining the Manila Bureau of Science has been turned over to the Pan-Pacific Science Council Friday night meetings. Here the scientists of all races in Manila discuss their affairs at a buffet supper, then get down to the real work of the evening, Dr. Manuel Roxas acting as leader. Senator Quezon promised Director Ford the services of a stenographer whenever he is in Manila. The stenographer will also take verbatim notes at the Pan-Pacific Club and Science Council weekly lectures.